

Key for the figures:

Figure 1

ion channel

ion current

5 field-effect transistor

 I_{TOTAL}

Figure 2

bath electrode

ion channel

10 AC current

gap

Figure 3

$$h = \frac{V_j}{V_s} \text{ with/without cell on}$$

electrode

15 phase in degrees

$$\text{phase of } h = \frac{V_j}{V_s} \text{ with/without cell on electrode}$$

frequency

Figure 5

measurement result

20 Figure 7

magnitude difference $h(\text{open}) - h(\text{closed})$

sodium-free solution

normal solution

frequency

25 phase difference (degrees)

sodium-free solution

normal solution

frequency